

REMARKS

The present application includes claims 1-32. Claims 1, 2, 5-15, 17-22 and 25-32 were rejected by the Examiner. Claims 3, 4, 16, 23, and 24 were objected to by the Examiner. Claims 1, 3, 4, 13, 16, 21, 23, 24, 28, 29 and 32 have been amended by this response.

By this Amendment and Response, independent claims 1, 13 and 21 have been amended. Claims 1 and 13 recite the limitation of “a transducer array pivotally mounted within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through the central scan plane parallel to a longitudinal axis of the probe.” (for example, see pg. 7, para. 3; pg. 8, para. 1; Figure 1). Claim 21 recites the step of “mounting a transducer array pivotally within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through a central scan plane parallel to a longitudinal axis of the probe.” (for example, see pg. 7, para. 3; pg. 8, para. 1; Figure 1). Thus, the Applicant respectfully submits that independent claims 1, 13 and 21, as well as their respective dependent claims, are allowable.

Claims 3, 4, 16, 23 and 24 have been objected to and have been rewritten as suggested by the Examiner in independent form. Therefore, Applicant submits that claims 3, 4, 16, 23 and 24 are allowable.

Claims 28, 29, and 32 have been rejected under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. By this Amendment and Response, claims 28, 29 and 32 have been

amended. Claim 28, as amended, distinctly claims “wherein the step of providing a centering device comprises providing a magnetic sensing device determining when the transducer array is aligned with the central scan plan.” Claim 29, as amended, distinctly claims the step of “configuring the transducer array to obtain 3D volumes.” Claim 32, as amended, recites the limitation that “the transducer array is located in at least one of a rectal probe, an endovaginal probe, a small part probe producing a sector-shaped scan plane, and a small linear probe producing a rectangular-shaped scan plane.”

Claims 1, 2, 9-15, 21, 22, and 30-32 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Cerofolini (USP 5,740,804).

Claims 5-8, 17-20, and 25-28 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Cerofolini as applied in claims 1, 13, and 21 above, and further in view of Angelsen (USP 4,757,818).

The Applicant now turns to the Examiner’s rejection of claims 1, 2, 9-15, 21, 22, and 30-32. Cerofolini contains a transducer array 12 with the initial orientation of the array 12 shown in Figure 2. The array 12 rotates along two different axes, 77 and 78. Along axis 77, array 12 rolls counter-clockwise and clockwise for a total of 90 degrees in either direction. (col. 6, lines 46-48; see Figure 2). Along axis 78, array 12 turns 90 degrees in either direction. (col. 7, lines 14-16; see Figure 2). When axis 77 has been rotated 90 degrees clockwise and axis 78 has been rotated 90 degrees clockwise, array 12 is perpendicular to the longitudinal axis of the probe shaft 70. Thus, the scan plane is parallel to the longitudinal axis of the probe shaft 70. However, the array

12 may not continue to rotate in the clockwise direction along either axis 77 or 78. To scan any objects below that plane, the probe shaft 70 would have to be rotated manually. Given the asymmetrical shape of the scan head 2 along the longitudinal axis (see Figure 1), that movement would result in patient discomfort.

Cerofolini does not teach “a transducer array pivotally mounted within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through the central scan plane parallel to the longitudinal axis of said probe.” This limitation is recited in independent claims 1 and 13. Additionally, Cerofolini does not teach “pivoting a transducer array pivotally mounted within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through the central scan plane parallel to the longitudinal axis of said probe.” This limitation is recited in independent claim 21.

Cerofolini, as discussed above, cannot continue the sweep of the array 12 along axes 77 and 78 to rotate beyond the point where the scan plane is parallel to the longitudinal axis of the probe shaft 70, thus precluding the ability of the array 12 to sweep through the plane parallel to the longitudinal axis of the probe shaft 70. Thus, the Applicant respectfully submits that, as amended, claims 1, 13, and 21 are allowable in view of Cerofolini.

Claims 2, 9-12, 14-15, 22, and 30-32 ultimately depend on claims 1, 13 or 21, and are patentable over Cerofolini for the reasons given above. Moreover, additional limitations of the dependent claims, such as 12, 14, and 32, are also not taught by Cerofolini. For example, the elongated probe shaft 70, shown in Figure 1, along with the “U” shape in the probe shaft 70, show how Cerofolini was designed for the purpose of Transthoracic echocardiography. (col. 1, line 21-52; see Figure 1). The region of interest when the shaft is inserted down the throat is not along the longitudinal axis of the probe shaft (further down the throat). Instead, the array 12

points in a direction perpendicular to the shaft 70 (see Figure 2), thus facing organs such as the heart. Claims 12, 14, and 32, for example, relate to possible regions of interest that could be located along or to the sides of the longitudinal axis of the probe. Thus, the probe may sweep through the central scan plane parallel to the longitudinal axis of the probe. For this and other reasons, Cerofolini does not teach the limitations of dependent claims 2, 9-12, 14-15, 22, and 30-32.

The Applicants next turn to the Examiner's rejection of claims 5-8, 17-20, and 25-28 as being unpatentable over Cerofolini as applied to claims 1, 13, and 21, and in further view of Angelsen. Angelsen consists of a single transducer 230 (not an array) that rotates along a single axis 226. (col. 4, lines 45-48; see Figure 2). The coil assembly 208 is moved via an electromagnetic force along the cylindrical axis of the coil assembly according to the current passed through the motor coil 206. Movement along the cylindrical axis of the coil assembly is done without the use of gears. An attachment portion 212 is attached to the flexible pulling element 210 which rotates pulleys 222 and 224 when the coil assembly 208 moves. (col. 3, line 64 – col. 4, line 52; see Figure 2). Angelsen measures the angular position of the transducer 230, by measuring the linear position of the electric motor coil 206 (not a stepper motor) through a measurement of the voltage induced on coil 220. (col. 4, lines 19-34). Thus, neither Cerofolini nor Angelsen teach or suggest the limitations of the claimed invention.

Thus, Angelsen does not teach the use of a transducer array. This limitation is recited in claims 1, 13 and 21. Rather, Angelsen uses a single transducer. Angelsen does not teach the use of a stepper motor. This limitation is recited in claims 2, 15, and 22. Instead, Angelsen uses an electric motor coil with no gears. Angelsen does not teach the use of a positioning device for

sensing an angular position of the transducer array. This limitation is recited in claims 5, 17, and 25. Angelsen does not teach the use of an optical device to sense the position of the array. This limitation is recited in claims 6, 18, and 26. Angelsen measures angular position of the single transducer using motor position determined by a voltage measurement. Angelsen does not teach the use of a centering device. This limitation is recited in claims 7, 19, and 28. Angelsen does not teach configuring the transducer array to obtain 3D volumes of scan planes. This limitation is recited in claims 9 and 30. Angelsen does not teach the use of a button to turn the array. This limitation is recited in claims 10, 30, and 31. Thus, Angelsen does not teach these and other limitations of the claims of the present invention.

One of ordinary skill in the art of ultrasound probes would not have combined Angelsen and Cerofolini. There was no motivation in the art to combine Angelsen and Cerofolini. Angelsen consists of a single transducer, while Cerofolini utilizes a transducer array. Cerofolini employs an array 12 that obviates the need in Angelsen to sweep the single transducer 230 back and forth.

Even assuming, for the sake of argument, that Angelsen and Cerofolini were combined, the combination would not work correctly because they teach away from each other at several points. For example, Angelsen employs a position sensor (col. 4, line 63), while Cerofolini uses “open loop commands...thereby obviating the need for a position sensor.” (col. 3, lines 2-5). Furthermore, Cerofolini purposefully did not include a position sensor because it would “increase the size of the probe.” (col. 2, lines 27-30). Angelsen uses a electric motor coil 206 and pulleys 222 and 224 to attain a constant sweep velocity and avoid the use of gear transmission arrangements to prevent vibrations. (col. 3, lines 8-26). The stepper motors 13 and 61 in Cerofolini do not provide a constant sweep speed and the gears 23, 25, 29, and 37 in

addition to the stepper motors 13 and 61 could cause vibrations harmful to the implementation of Angelsen. (col. 3, lines 46-48; col. 6, lines 21-24). Thus, the combination of Cerofolini and Angelsen would not be viable, nor would someone of ordinary skill combine them.

Additionally, neither Cerofolini nor Angelsen, taken alone or together, teaches or suggests the limitations of the claimed invention. Neither Cerofolini nor Angelsen teach or suggest “a transducer array pivotally mounted within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through the central scan plane parallel to the longitudinal axis of said probe.” This limitation is recited in independent claims 1 and 13. Additionally, neither Angelsen nor Cerofolini, alone or in combination, teaches or suggests “pivoting a transducer array pivotally mounted within the housing, the transducer array being pivotal around a rotation axis, the transducer array capable of sweeping through the central scan plane parallel to the longitudinal axis of said probe.” This limitation is recited in independent claim 21. Thus, the Applicant respectfully submits that independent claims 1, 13, and 21.

The Applicant also respectfully submits that the dependent claims of the present application are allowable in view of Cerofolini and Angelsen. For example, claims 5, 17, and 25 recite “a position sensing device for sensing an angular position of the transducer array with respect to a reference angle.” It is clear that neither prior art reference taught the measurement of the angular position of the array. Additionally, claims 6, 18, and 26 all recite “an optical sensing device for sensing an angular position.” Neither Angelsen nor Cerofolini make any mention of an “optical sensing device” used to sense the angular position of the transducer array. Claims 7, 19, and 27 recite “a centering device determining when the transducer array is aligned with the central scan plane.” There is no centering device in Angelsen. The device determines the linear

displacement of electric motor coil 206 from second coil 220. Given that the flexible pulling element 210 is flexible, the distance between 206 and 220 when the transducer is centered varies, making the measurement inaccurate. Cerofolini teaches open loop controls obviating the need for a centering device.

The Applicant respectfully submits that claims 1, 13, and 21 (and hence their dependent claims 5-8, 17-20, and 25-28) are patentable for the reasons given above.

By this response claims 1, 13 and 21 have been amended. Claims 1, 13, and 21 recite the limitation that the transducer array is capable of sweeping through the central scan plane parallel to a longitudinal axis of the probe. As described above, neither Angelsen nor Cerofolini teach or suggest this limitation. Thus, the Applicant respectfully submits that independent claims 1, 13, and 21, as well as their respective dependent claims, are allowable.

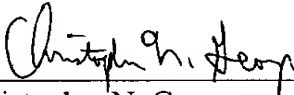
CONCLUSION

The Applicant submits that the present application is in condition for allowance. If the Examiner has any questions or the Applicant can be of any assistance, the Examiner is invited and encouraged to contact the Applicant at the number below.

The Commissioner is authorized to charge any additional fees or credit overpayment to the Deposit Account of GTC, Account No. 070845.

Respectfully submitted,

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